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(54) **PNEUMATIC NAIL GUN**

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(51) **Int. Cl.**
B25C 1/04 (2006.01)

(52) **U.S. Cl.** **227/8**; 227/130

(58) **Field of Classification Search** 227/130, 227/8, 136, 10

See application file for complete search history.

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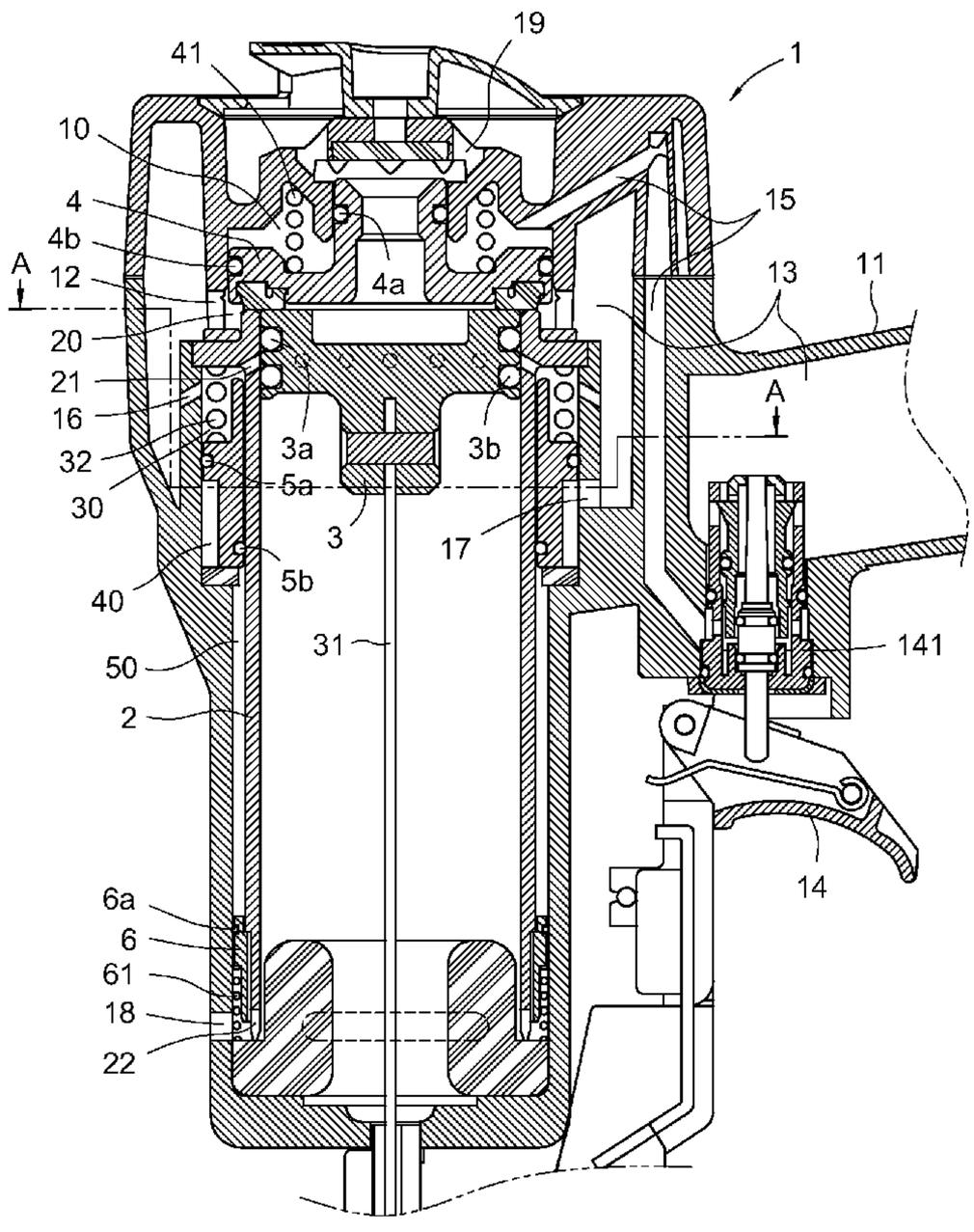
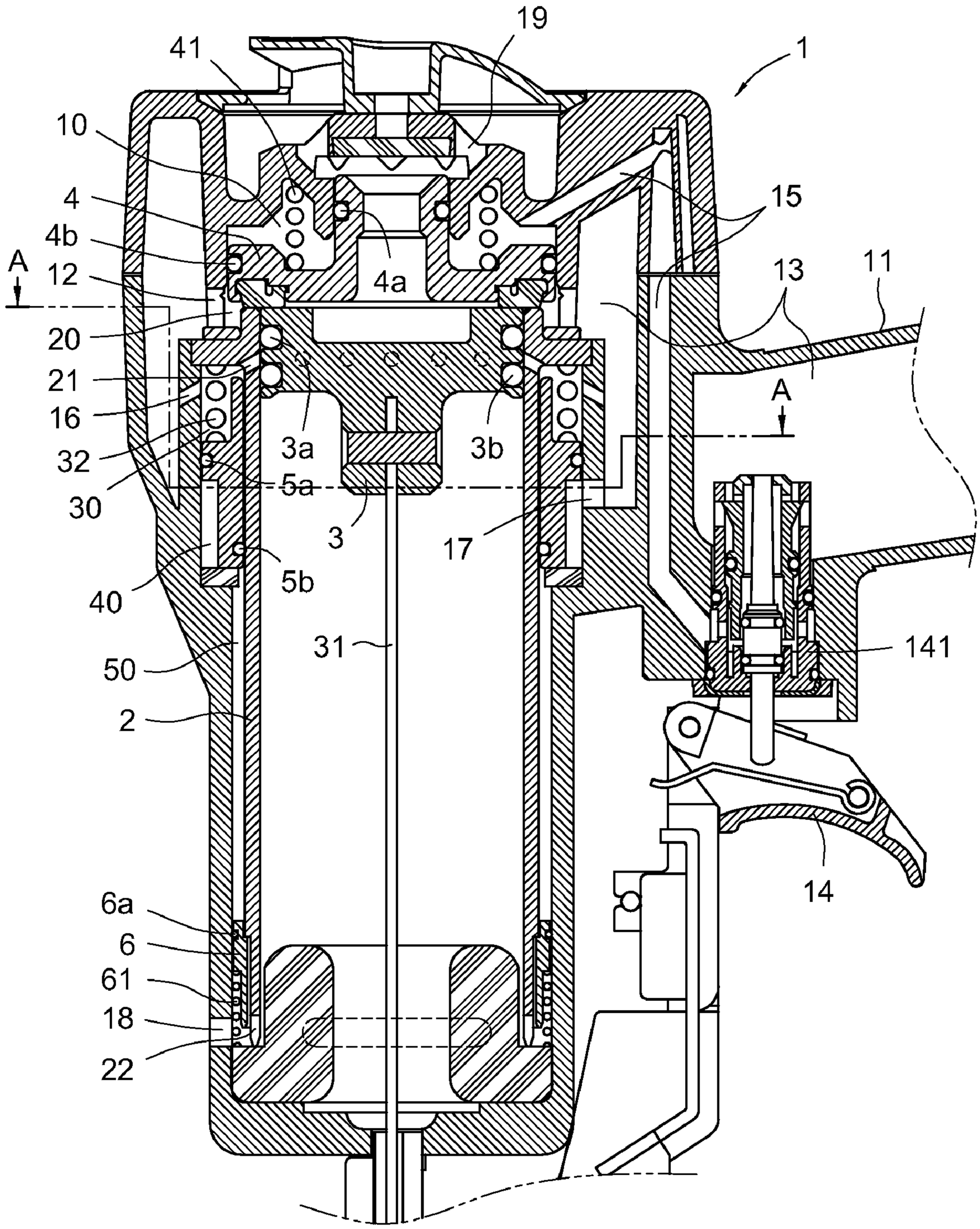
Primary Examiner—Scott A. Smith

(57) **ABSTRACT**

A pneumatic nail gun has a gun body having a main air housing; a cylinder fixed in the main air housing; a hitting piston slidably movable in the cylinder; a dish-shaped piston disposed at a top end portion of the cylinder; an upper slidable sleeve valve disposed at a top portion of an out peripheral surface of the cylinder, which is driven to move upward by the high pressure air in the main air housing; and a lower slidable sleeve valve disposed at a lower portion of an outer peripheral surface of the cylinder, which is driven to move downward for guiding the high pressure air into the cylinder for upward deposition of the hitting piston when the upper slidable sleeve valve moves upward, and is driven to upward reposite when the hitting piston moves to its upper dead center.

10 Claims, 11 Drawing Sheets

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6a
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61
18
22

Fig. 1

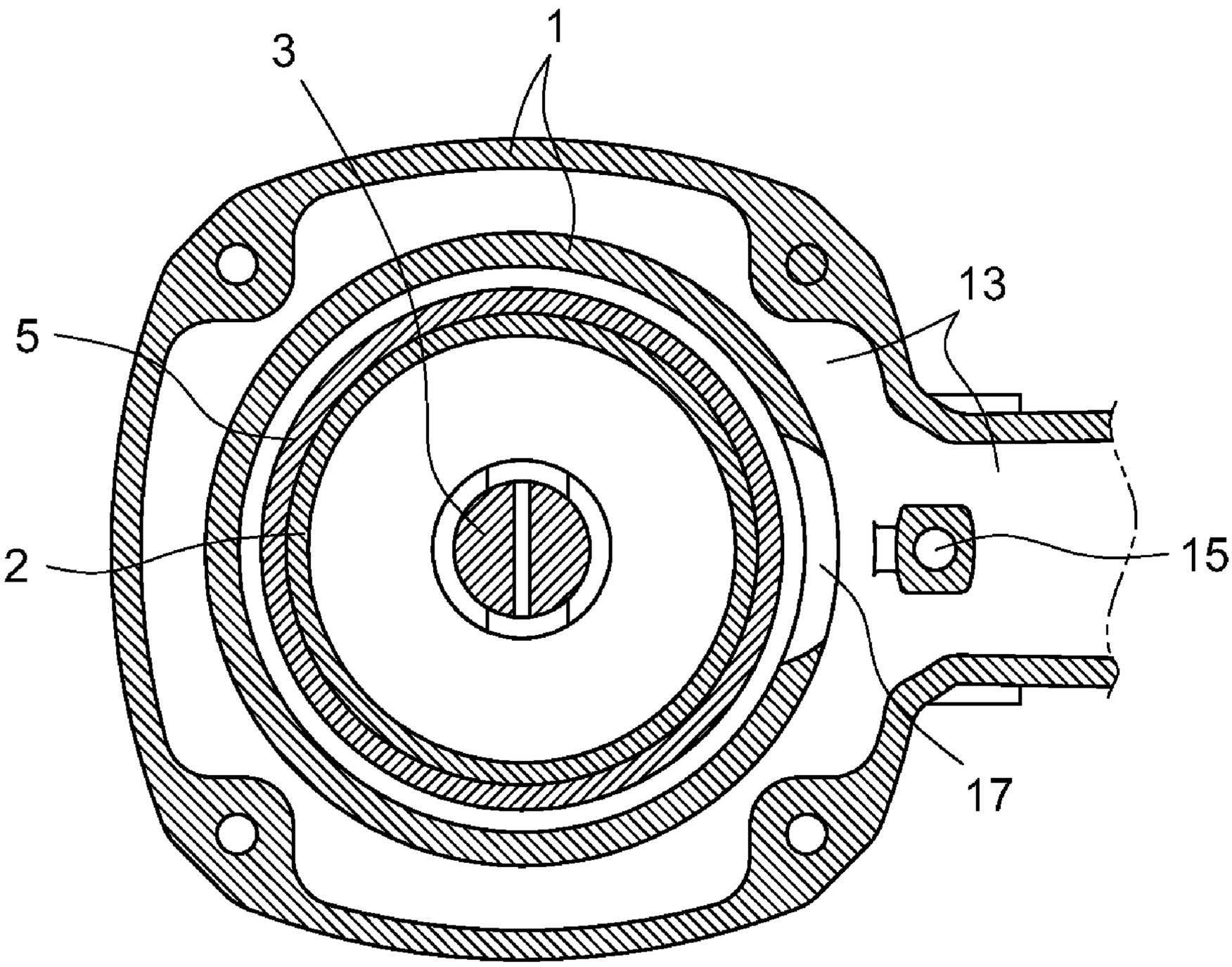


Fig. 2

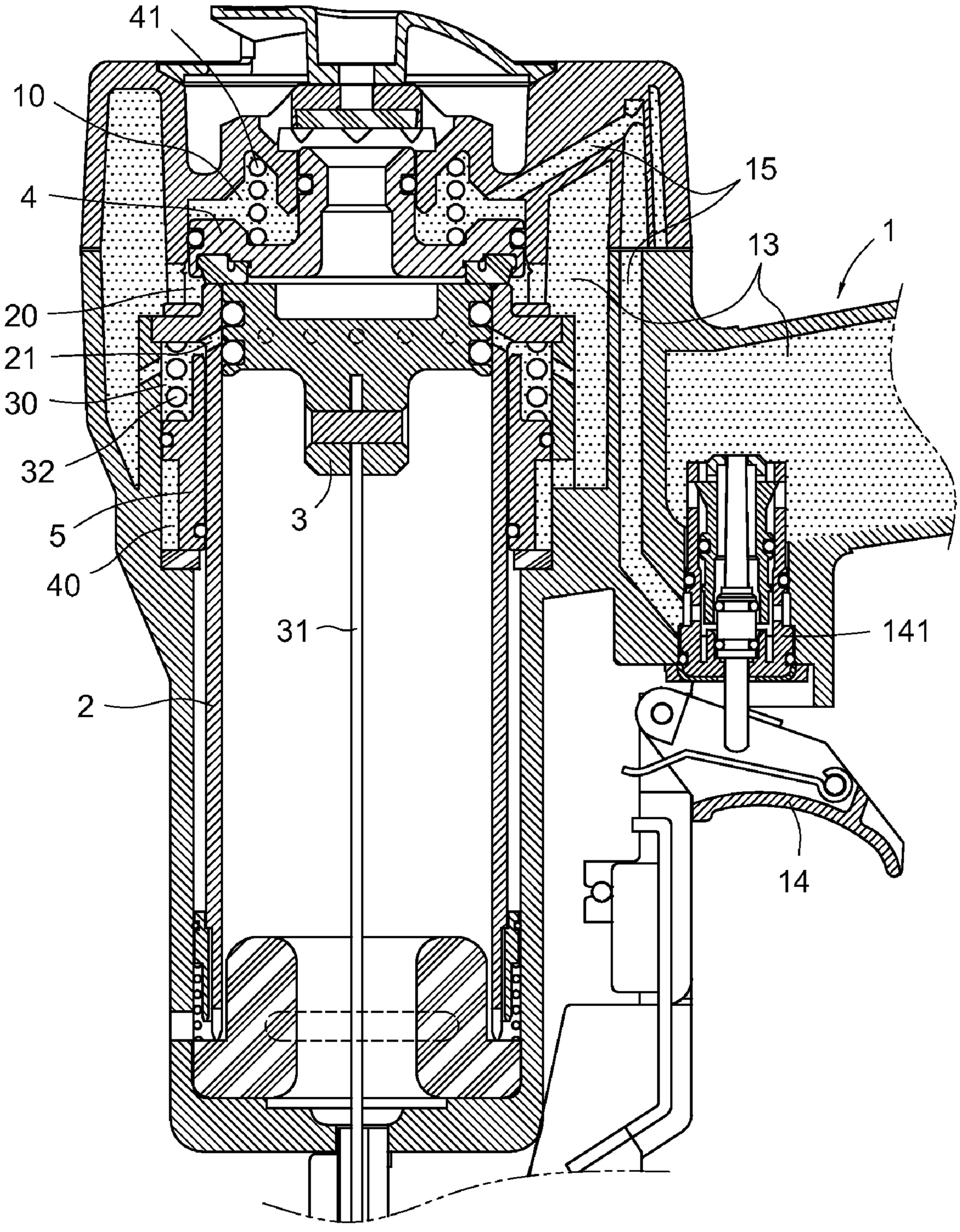


Fig. 3

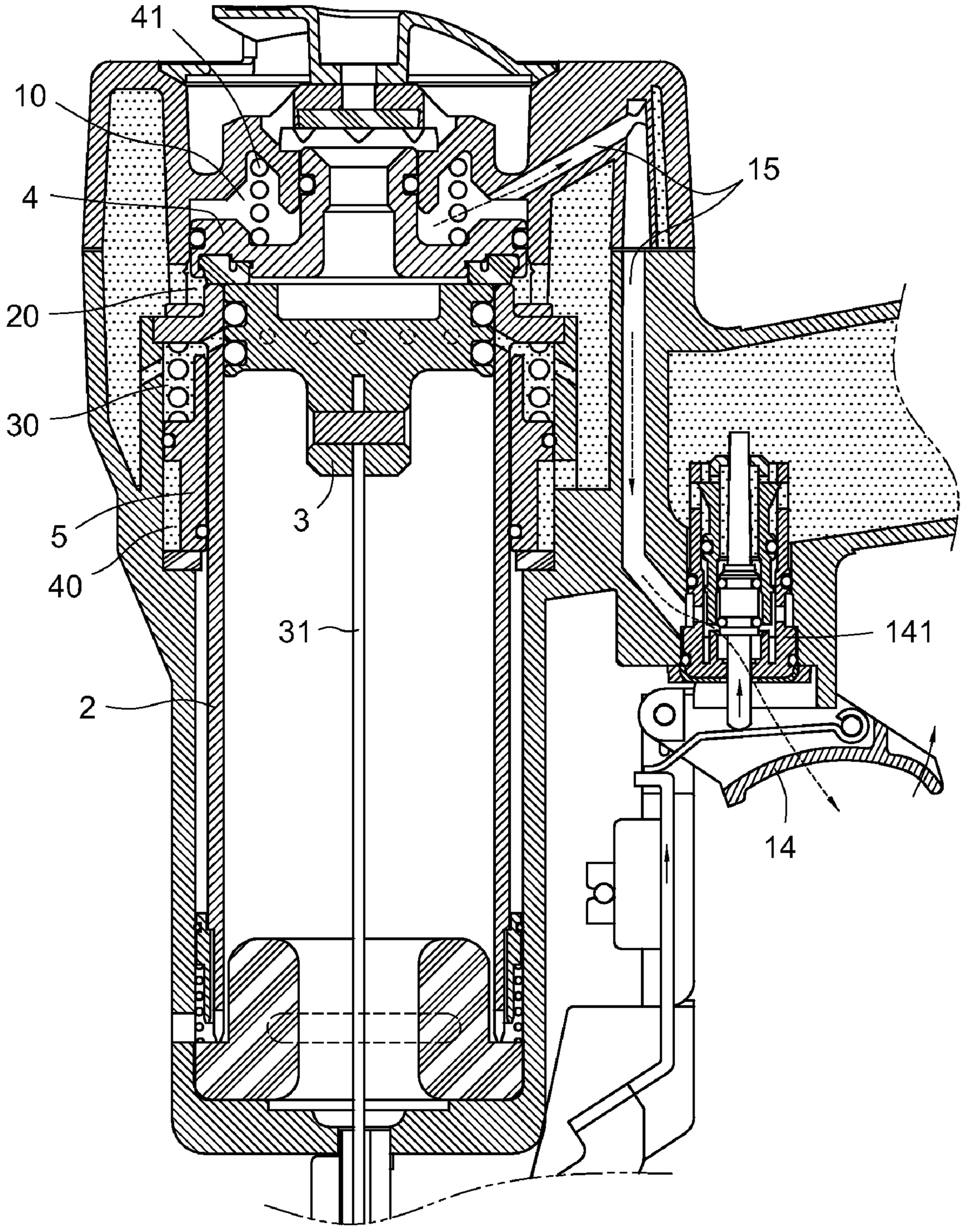


Fig. 4

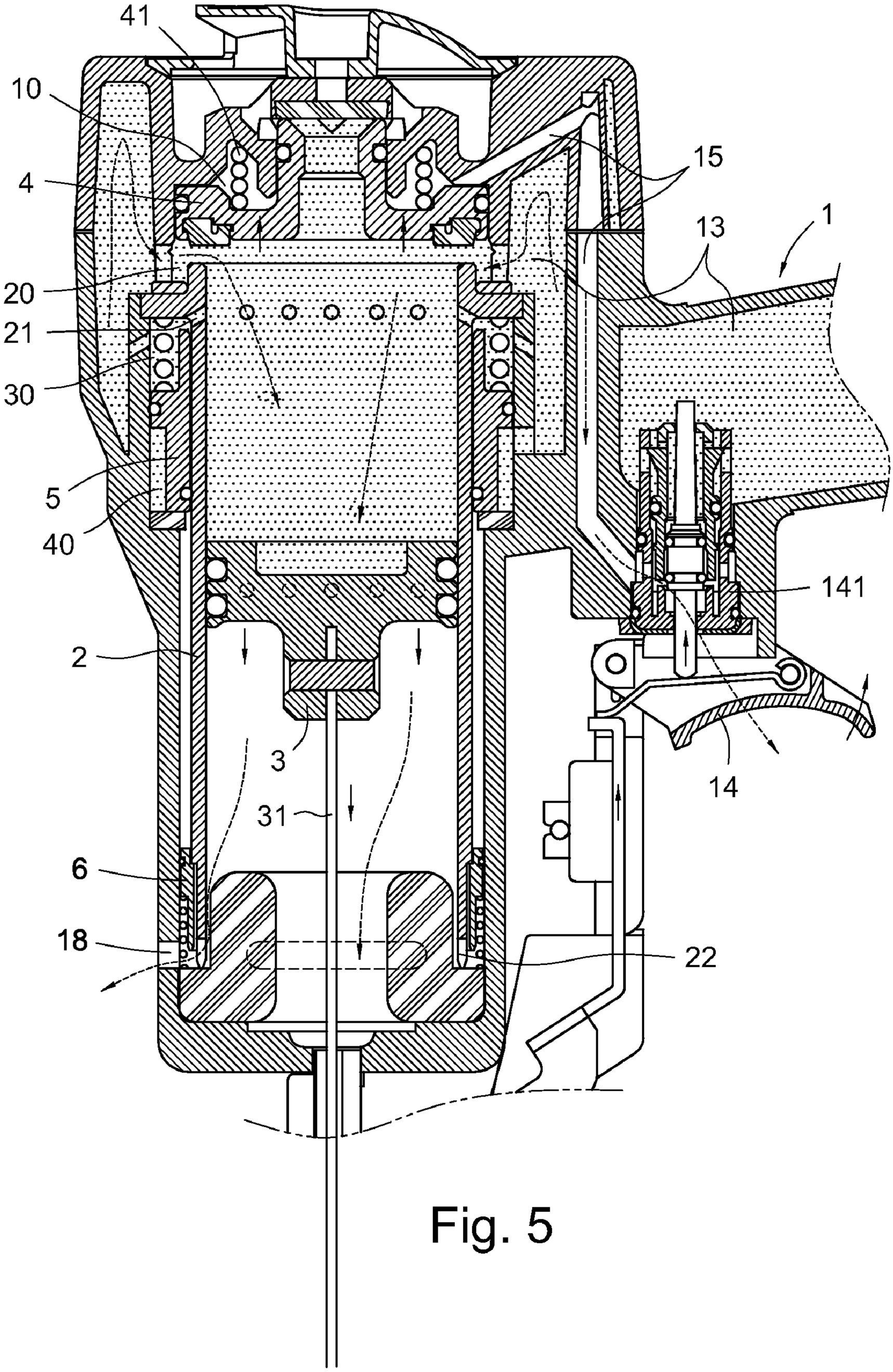


Fig. 5

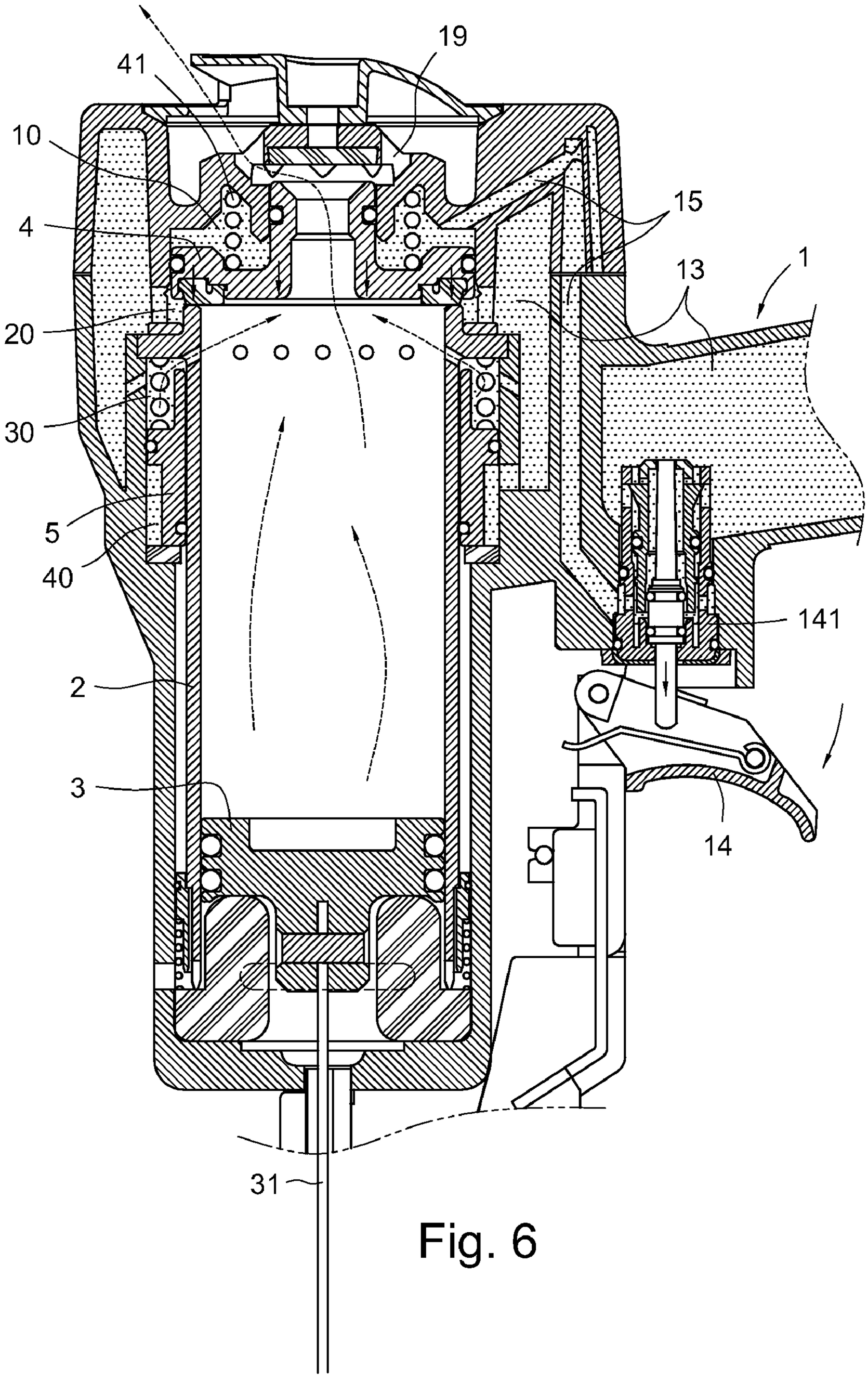


Fig. 6

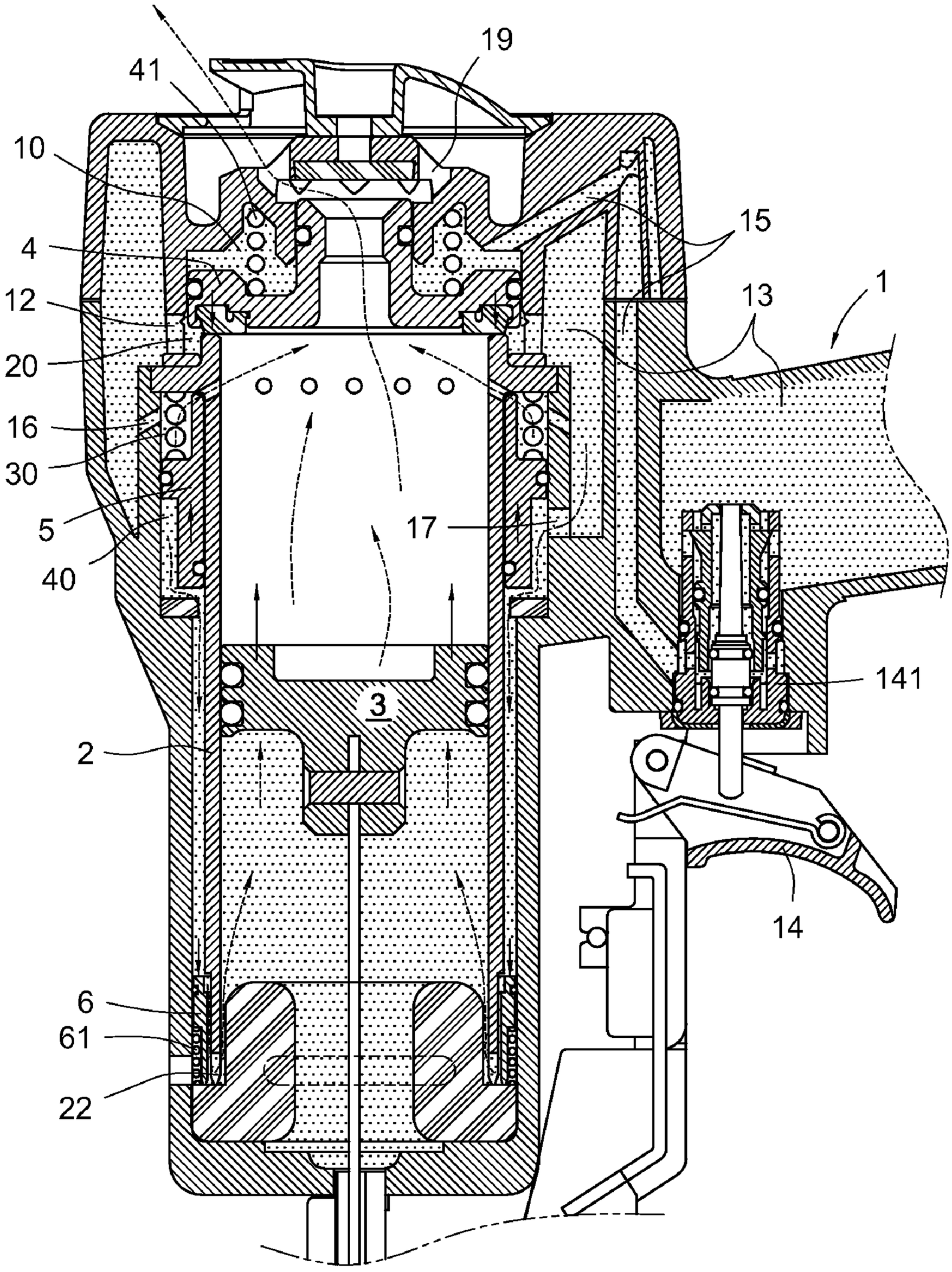
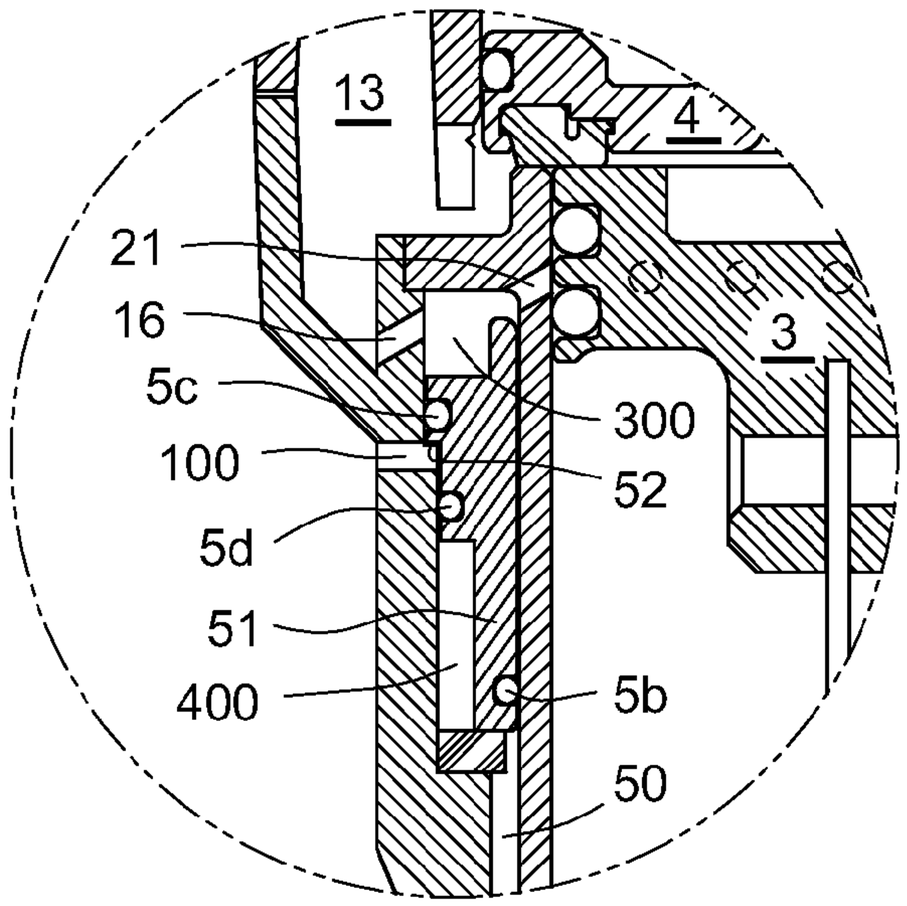


Fig. 7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5d
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3
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5b
50

Fig. 8

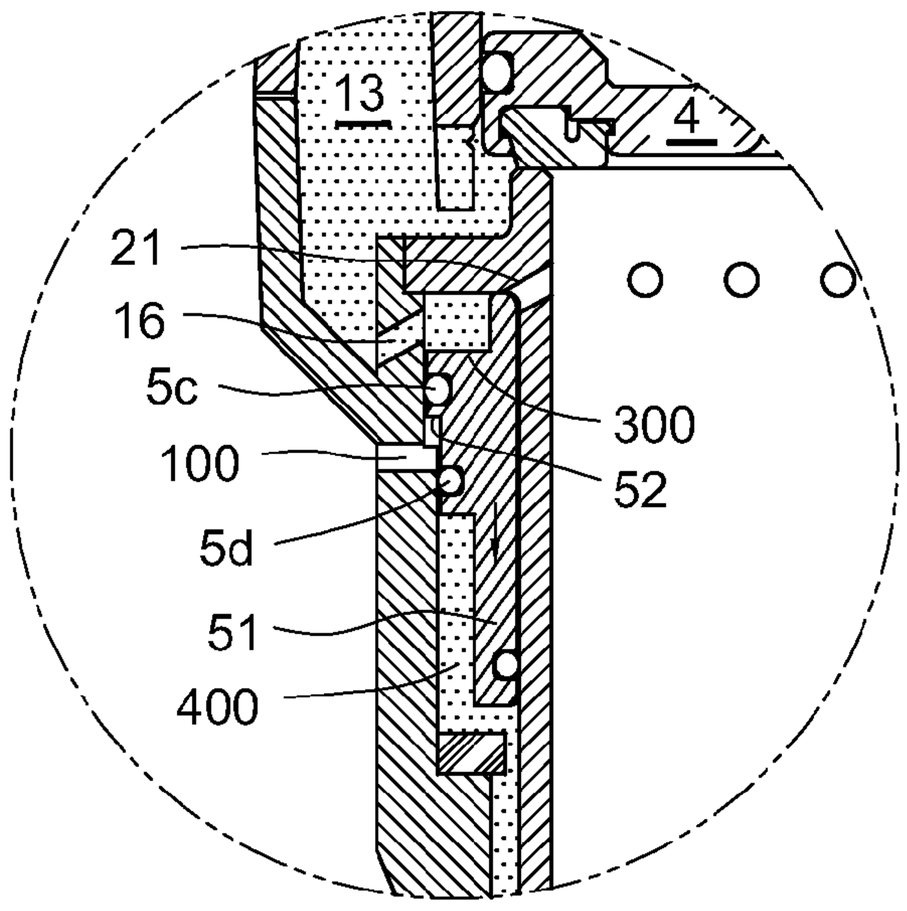
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Fig. 9

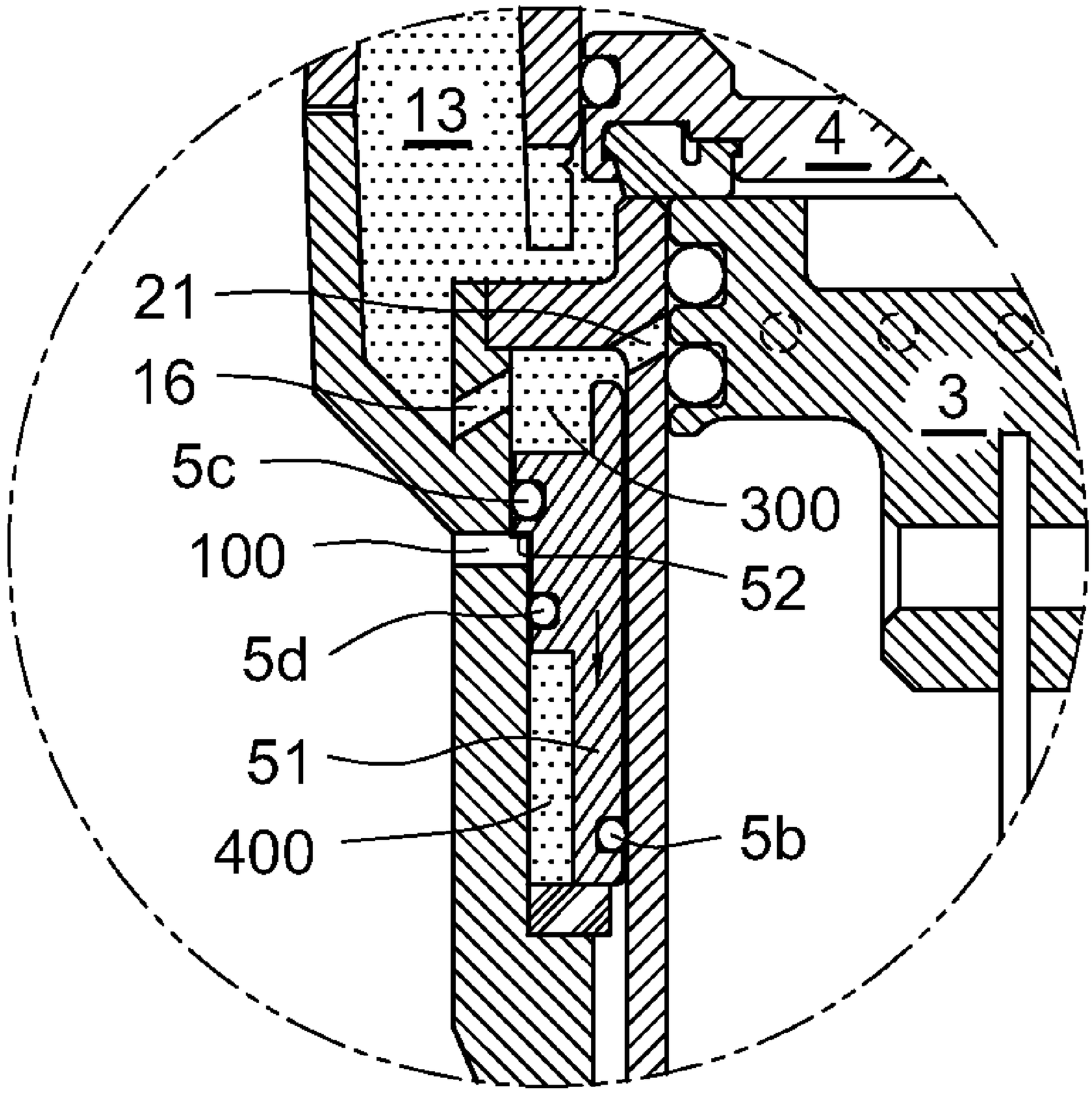

Fig. 10

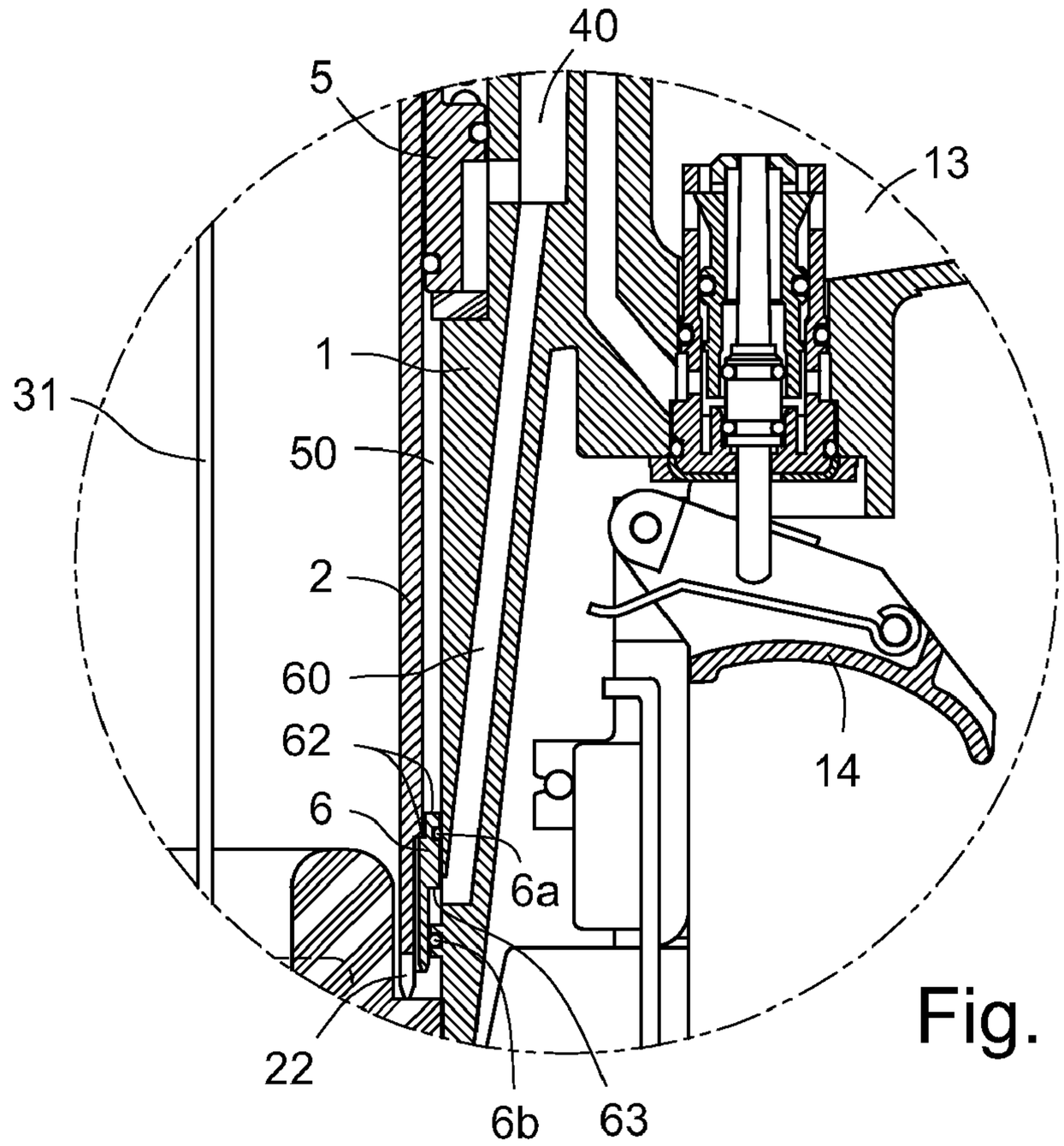

Fig. 11

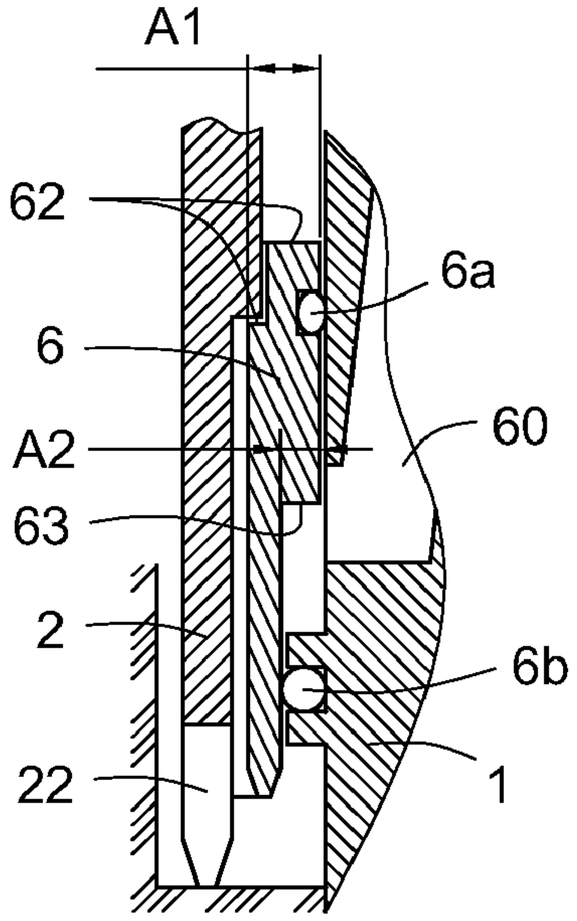

Fig. 12

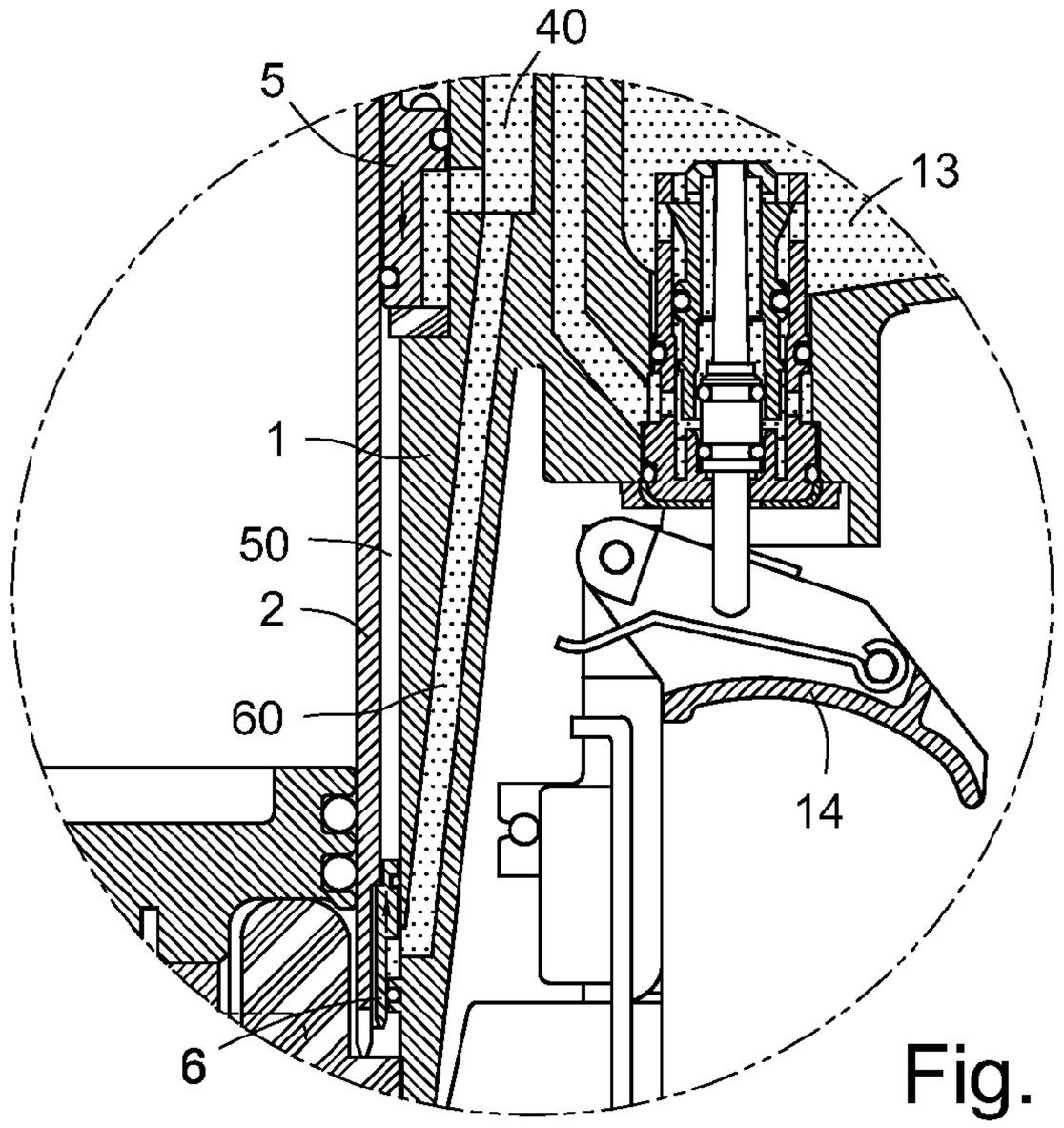

Fig. 13

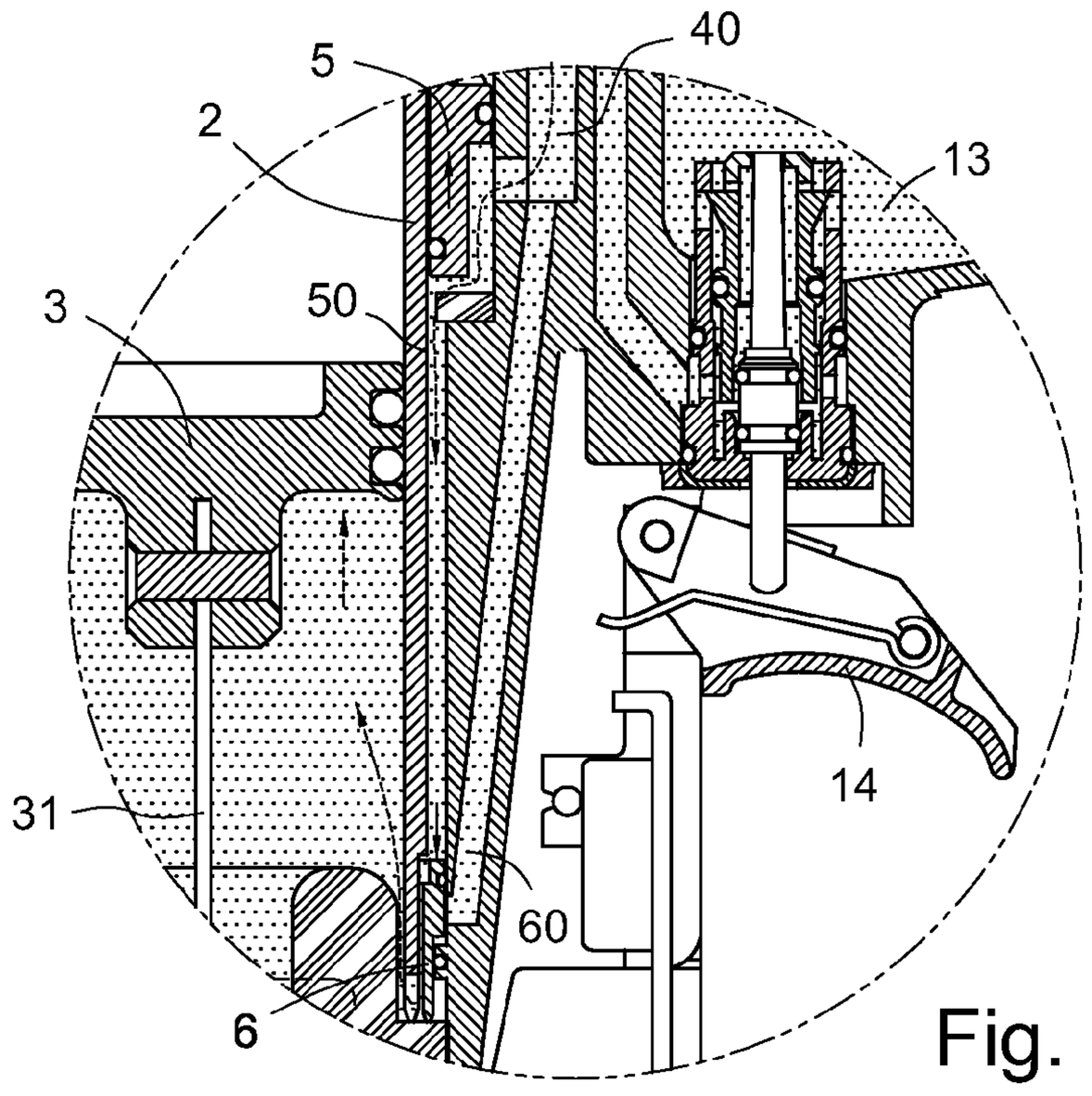

Fig. 14

PNEUMATIC NAIL GUN

BACKGROUND

The present invention relates to a pneumatic nail gun, and particularly to a pneumatic nail gun having an upper slidable sleeve valve and a lower slidable sleeve valve.

The pneumatic nail gun generally utilizes a compressed high pressure air to drive nails to punch, which is a gun-shaped pneumatic tool. The general structure and function of a nail gun is briefly introduced as follows. A nail gun has a gun body, the gun body having a gun handle and a gun head; a fastening cylinder disposed in the gun head; a high-pressure gas pipe coupled to one end of the gun handle, and a high-pressure gas being input and introduced into the cylinder; a piston disposed in the cylinder, the piston connected to a nail shooting mechanism at the external end of the gun head, and the nail shooting mechanism coupled to a nail magazine. When the gun body is triggered, and the piston is pushed downward by the compressed high pressure air such that the nail shooting mechanism can shoot out the nail at the nailing position. In addition, an air chamber is provided at an outer peripheral surface of the cylinder, which receives high pressure air from the cylinder to drive the piston to its original position when the piston moves its lower dead center.

However, the air chamber just can receive the high pressure air when the piston moves downward and can not receive high pressure air during the piston moves upward. Thus, the collection of the high pressure air in the air chamber for upward movement of the piston is limited, and the stability of the upward movement of the piston is lower. Especially, in the process of continuous nail punching, the instability upward movement of the piston lowers the speed and efficiency of nail punching.

For resolving the question, one method of adding the cubage of the air chamber is provided in recently technology. However, the method still is not an ideal resolution.

Accordingly, what is needed is a pneumatic nail gun that can overcome the above-described deficiencies.

BRIEF SUMMARY

A pneumatic nail gun has a gun body, which has a main air housing collecting a compressed high pressure air with a constant pressure, and a trigger at one end of the main air housing driving the high pressure air to shoot a nail; a cylinder fixed in the main air housing; a hitting piston slidably movable in the cylinder; a dish-shaped piston disposed at a top end portion of the cylinder, which is driven to move upward and guides the high pressure air into the cylinder for driving the hitting piston rapidly move downward when the trigger is pressed, and is driven to move downward by the high pressure air in the main air housing for closing the fluid communication into the cylinder when the trigger is released; an upper slidable sleeve valve disposed at a top portion of an out peripheral surface of the cylinder, which is driven to move upward by the high pressure air in the main air housing when the trigger is released; a lower slidable sleeve valve disposed at a lower portion of an outer peripheral surface of the cylinder, which is driven to move downward for guiding the high pressure air into the cylinder for upward deposition of the hitting piston **3** when the upper slidable sleeve valve moves upward, and is driven to upward reposite when the hitting piston moves to its upper dead center, the upper slidable sleeve valve being driven to downward reposite and closing the fluid communication to the lower slidable sleeve valve.

The pneumatic nail gun utilizes the upper and the lower slidable sleeve valves to realize the stably upward movement of the piston through rapidly and continuously guiding the compressed high pressure air into the cylinder in the process of upward deposition of the hitting piston.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features and advantages of the various embodiments disclosed herein will be better understood with respect to the following description and drawings, in which like numbers refer to like parts throughout, and in which:

FIG. **1** is a cross-sectional view of a pneumatical nail gun according to a first embodiment of the present invention, the pneumatical nail gun having an upper slidable sleeve valve and a lower slidable sleeve valve;

FIG. **2** is a cross-sectional view of the pneumatical nail gun of FIG. **1**, taken along a line of A-A of FIG. **1**;

FIG. **3** is a cross-sectional view of the pneumatical nail gun of FIG. **1**, showing a state of high pressure air gathered in a main air housing, a first air chamber, a second air chamber, a third air chamber and a fourth air chamber of the pneumatical nail gun;

FIG. **4** shows a cross-sectional view of the pneumatical nail gun of FIG. **1**, showing a state of the high pressure air being exhausted from the first air chamber, when a trigger is pressed;

FIG. **5** shows a cross-sectional view of the pneumatical nail gun of FIG. **1**, showing a state after the trigger is pressed, wherein the dish-shaped piston is driven to move upward by the high pressure air and the hitting piston moves downward to a lower dead center;

FIG. **6** shows a cross-sectional view of the pneumatical nail gun of FIG. **1**, showing a state of the high pressure air re-collecting into the first air chamber for downwardly repositing the dish-shaped piston, when the trigger is released, and the high pressure air in the third air chamber being discharged;

FIG. **7** shows a cross-sectional view of the pneumatical nail gun of FIG. **1**, showing a state after the trigger is released, wherein the upper slidable sleeve valve moves upwards and the high pressure air is guided into the fourth air chamber to drive the lower sleeve valve move downwardly for continuously guiding the high pressure air into the cylinder to drive the hitting piston move upwardly;

FIG. **8** is a cross-sectional view of a part of a pneumatical nail gun according to a second embodiment of the present invention, showing a step formed at a peripheral surface of an upper slidable sleeve valve;

FIG. **9** and FIG. **10** show an operation state of the pneumatical nail gun of FIG. **8**, showing the upper sleeve valve rapidly downward reposited through the pressure thrust of the high pressure air in a third air chamber larger than that in a fourth air chamber;

FIG. **11** is a cross-sectional view of a part of a pneumatical nail gun according to a third embodiment of the present invention, showing an upper step and a lower step formed at a peripheral surface of a lower slidable sleeve valve;

FIG. **12** shows a partly enlarged view of the lower slidable sleeve valve, showing the upper step having a larger forcing area than that of the lower step; and

FIG. **13** and FIG. **14** show an operation state of the pneumatical nail gun of FIG. **11**, showing the lower sleeve valve rapidly downward moved and upward reposited.

DETAILED DESCRIPTION

Referring to FIG. **1**, a pneumatic nail gun according to a first embodiment of the present invention is shown. The pneumatic nail gun has a gun body **1**, an immovable cylinder **2**, a hitting piston **3**, a dish-shaped piston **4**, an upper slide sleeve valve **5** and a lower slide sleeve valve **6**.

The gun body **1** has a main air housing **13** formed in a gun handle and gun head, which communicate with each other, for coutinuously collecting a compressed high-pressure air therein (as shown in FIG. **2**). The gun body **1** further has a trigger **14** at one end of the main air housing **13**, and a trigger valve **141** is disposed in the main air housing **13** to be operated by the manipulation of the trigger **14**. The trigger valve **141** provides a first valve position by the non-manipulation to the trigger **14** to fluidly communicate the main air housing **13** and a first air chamber **10** in the gun body **1** with the high pressure air, and provides a second valve position by manipulation to the trigger **14** to shut off the fluid communication between the main air housing **13** and the first air chamber **10** (as shown in FIG. **3** and FIG. **4**).

The cylinder **2** is fixed in the gun body **1**. The hitting piston **3** is slidably and reciprocally movably disposed in the cylinder **2**, and a driver blade **31** extends from a lower end surface (not labeled) of the hitting piston **3**. A tip end of the driver blade **31** can protrude out of the gun body **1** for punching against a nail in accordance with a downward movement of the hitting piston **3**. In addition, two annular ring grooves (not labeled) are formed in an outer peripheral surface of the hitting piston **3**, and two O-rings **3***a*, **3***b* are assembled in the two ring grooves, respectively. The two O-rings **3***a*, **3***b* are made from a resilient or elastic material such as rubber to provide sealing contact between the cylinder **2** and the hitting piston **3**.

The upper slidable sleeve valve **5** is disposed at a top portion of an out peripheral surface of the cylinder **2**, which further respectively provides at least one air-tight ring **5***a*, **5***b* at its inner sidewall and outer sidewall, for respectively realizing sealing contact between the upper slidable sleeve valve **5** and an inner sidewall of the gun body **1**, and between the upper slidable sleeve valve **5** and an outer sidewall of the cylinder **2**. When the trigger **14** is released (as shown in FIG. **6**), the upper slidable sleeve valve **5** is driven to move upward by the high pressure air in the main air housing **13**.

The lower slidable sleeve valve **6** is disposed at a lower portion of an outer peripheral surface of the cylinder **2**, which provides at least one air-tight ring **6***a* between the outer sidewall thereof and an inner sidewall of the gun body **1**. When the upper slidable sleeve valve **5** moves upward, the lower slidable sleeve valve **6** is driven to move downward for guiding the high pressure air into the cylinder **2** and driving the hitting piston **3** to move upward. When the hitting piston **3** moves upward for reposition, the upper slidable sleeve valve **5** is driven to move downward for reposition and closing the fluid communication to through the lower slidable sleeve valve **6** to the cylinder **2**.

The first air chamber **10** is formed between a top end of the dish-shaped piston **4** and an inner peripheral surface of the gun body **1**. Before the trigger **14** is pressed (as shown in FIG. **3**), the first air chamber **10** fluidly communicate with the main air housing **13** through a trigger passage **15** formed in the gun body **1**, wherein the compressed high-pressure air in the main air housing **13** flows into the first air chamber **10** and the high-pressure air drives the dish-shaped piston **4** to move downward. When the trigger **14** is pressed (as shown in FIG. **4** & FIG. **5**), the trigger valve **141** shut off the trigger passage **15** between the main air housing **13** and the first air chamber **10** and the compressed high-pressure air in the first air chamber **10** is discharged therefrom.

Two O-rings **4***a*, **4***b* are assembled in an inner ring groove (not labeled) and an outer ring groove (not labeled) of the dish-shaped piston **4**, respectively, to provide air-sealing of the first air chamber **10**.

A second air chamber **20** is formed between the dish-shaped piston **4** and a top portion of an outer peripheral surface of the cylinder **2**. The second air chamber **20** fluidly communicates with the main air housing **13** through a plurality of through holes **12** formed at the gun body **1** for guiding the compressed high-pressure air in the main air housing **13** into the second air chamber **20**. The high-pressure air in the second air chamber **20** drives the dish-shaped piston **4** to move upward when the high-pressure air in the first air chamber **10** is discharged (as shown in FIG. **4** & FIG. **5**).

A top spring **41** is disposed in the first air chamber **10**. When the first air chamber **10** is charged with the high-pressure air (as shown in FIG. **3** & FIG. **6**), a sum of an elastic deformation force of the top spring **41** and a pressure thrust of the high-pressure air in the first air chamber **10** is larger than a pressure thrust of the high-pressure air in the second air chamber **20**, which assures the dish-shaped piston **4** stably downward movement. When the high-pressure air in the first air chamber **10** is discharged therefrom (as shown in FIG. **4** & FIG. **5**), the single elastic deformation force of the top spring **41** is smaller than a pressure thrust of the high-pressure air in the second air chamber **20**, which assures the dish-shaped piston **4** stably upward movement and guides the high pressure air in the main air housing **13** into the cylinder **2** to drive the hitting piston move downward.

The pneumatic air gun further has a third air chamber **30**, a plurality of top vent holes **21**, a fourth air chamber **40** and a plurality of bottom vent holes **22**.

The third air chamber **30** is positioned among the cylinder **2**, the upper slidable sleeve valve **5** and the inner peripheral surface (not labeled) of the gun body **1**. The gun body **1** has a plurality of second through holes **16** fluidly communicating with the main air housing **13** for guiding compressed high-pressure air into the third air chamber **30**. The high-pressure air in the third air chamber **30** drives the upper slidable sleeve valve **5** to move downward to its lower dead center when the dish-shaped piston **4** moves downward for reposition and the hitting piston **3** moves upward for reposition (as shown in FIG. **3**).

The plurality of top vent holes **21** is formed at a top portion of the cylinder **2**, which communicates the third air chamber **30** and the cylinder **2**. The top vent holes **21** have a fluid communication area larger than that of the second through holes **16**. Thus, when the upper slidable sleeve valve **5** and the dish-shaped piston **4** move downward, the high pressure air of the third air chamber **30** through the second through holes **16** can be quickly discharged to the cylinder **2** by the top vent holes **21**. And, when the hitting piston **3** moves upward for reposition, the plurality of top vent holes **21** can quickly close the fluidly communication from the third air chamber **30** to the cylinder **2**.

A fourth air chamber **40** is formed between an inner peripheral surface of the gun body **1** and an outer peripheral surface of the upper slideable sleeve valve **5**. The fourth air chamber **40** fluid communicates with the main air housing **13** to guide compressed high-pressure air in the main air housing **13** to the fourth air chamber **40** through at least one third through hole **17** formed in the gun body **1** (as shown in FIG. **2** & FIG. **3**). The high pressure air in the fourth air

chamber **40** drives the upper slidable sleeve valve **5** to move upward when the high-pressure air in the third air chamber **30** is discharged, and the lower slidable sleeve valve **6** to move downward (as shown in FIG. **6** & FIG. **7**).

A plurality of bottom vent holes **22** is positioned at a bottom end portion of the cylinder **2**. When the lower sleeve valve **6** move downward, the bottom vent holes **22** guides the high-pressure air in the fourth air chamber **40** into the cylinder **2** to drive the hitting piston **3** to upward deposite (as shown in FIG. **7**).

In addition, an intermediate spring **32** can be provided in the third air chamber **30** (as shown in FIG. **3**). A sum of an elastic deformation force of the intermediate spring **32** and a pressure thrust of the high-pressure air in the third air chamber **30** is larger than a pressure thrust of the high-pressure air in the fourth air chamber **40**, and the single elastic deformation force of the intermediate spring **32** is smaller than a pressure thrust of the high-pressure air in the fourth air chamber **40**, which assures the upper sleeve valve **5** downward deposition when the third and the fourth air chambers **30**, **40** are charged with high pressure air therein, and assures the upper sleeve valve **5** upward deposition when the high-pressure air in the third air chamber **30** is discharged therefrom (as shown in FIG. **7**).

In alternative modification, the pneumatic nail gun can further provide a ring groove **50** (as shown in FIG. **1**) defining by the outer peripheral surface of the cylinder **2**, the upper slidable sleeve valve **5**, the lower slidable sleeve valve **6**, and the gun body **1**, which can drive the lower slidable sleeve valve **6** to move downward when the high pressure air in the fourth air chamber **40** is guided therein.

In another alternative modification, the pneumatic nail gun can further provide a bottom spring **61** (as shown in FIG. **3**) used to push the lower slidable sleeve valve **6**, which has an elastic deformation force less than a pressure thrust of the high-pressure air in the fourth air chamber **40** or a pressure thrust of the high-pressure air in the ring groove **50** guided from the fourth air chamber **40**. Thus, the lower slidable sleeve valve **6** can be driven to move downward by the high pressure air, when the upper slidabe sleeve valve **5** move upward; and can be driven to upward deposite when the upper slidabe sleeve valve **5** downward deposite.

Referring to FIG. **8**, a pneumatic nail gun according to a second embodiment of the present invention is shown. The pneumatic nail gun does not have the intermediate spring **32** in the first embodiment, which can provide a step **52** at an peripheral surface of an upper slidable sleeve valve **51**, two annular ring grooves (not labeled) formed in an outer peripheral surface of the upper slidable sleeve valve **51**, respectively at an upper side and a lower side of the step **52**, and two air-tight rings **5***c*, **5***d* assembled in the two ring grooves, respectively. In addition, a gun body has an exhausting hole **100** between the two air-tight rings **5***c*, **5***d*. Thus, when the upper slidable sleeve valve **51** moves downward for deposition, the step **52** can decrease the forcing area and the pressure thrust of a high-pressure air in the fourth air chamber **400** and realizes the pressure thrust of a high-pressure air in the third air chamber **300** being larger than that of the high-pressure air in the fourth air chamber **400**, which assures the upper sleeve valve **51** downward deposition when the third and the fourth air chambers **300**, **400** are charged with high pressure air therein, and assures the upper sleeve valve **51** upward deposition when the high-pressure air in the third air chamber **300** is discharged therefrom (as shown in FIG. **9** & FIG. **10**). Thus, the intermediate spring **32** can be omitted and the cost can be lowered.

In operation, before the trigger **14** is manipulated as shown in FIG. **3**, compressed air in the main air housing **13** is applied to the first air chamber **10** through the trigger valve **141** and trigger passage **15**, and to the second, third, and fourth air chambers **20**, **30**, **40** through the first through holes **12**, the second through holes **16**, and the third through holes **17**, respectively. Therefore, the high-pressure air in the first air chamber **10** and the top spring **41** drive the dish-shaped piston **4** to move to its lower dead center to close the top end portion of the cylinder **2**, and the high-pressure air in the third air chamber **30** or combined with the intermediate spring **32** drive the upper slidable sleeve valve **5** to move to its lower dead center and closes the fluidly communication between the fourth air chamber **40** and the ring groove **50**. At the same time, the hitting piston **3** closes the fluid communication between the cylinder **2** and the top vent holes **21**, and the lower slidable sleeve valve **6** is driven to move upward to a dead center by an elastic deformation force of the bottom spring **61**.

When the trigger **14** is pulled as shown in FIG. **4**, the trigger valve **141** closes the fluid communication between the main air housing **13** and the trigger passage **15**. Compressed high-pressure air in the first air chamber **10** is discharged to the atmosphere, so that high-pressure air in the second air chamber **20** drives the dish-shaped piston **4** to move to its upper dead center, which opens the fluid communication of the top portion of the second air chamber **20**, and introduces high-pressure air into the cylinder **2**, applied to the hitting piston **3**. Thus, the hitting piston **3** rapidly moves toward the nail. In addition, at least one bottom exhausting hole **18** formed at a bottom portion of the gun body **1** is opened for discharging residual air under the hitting piston **3** to an atmosphere, and the top vent holes **21** opens for downward movement of the hitting piston **3**.

Then, when the user releases the trigger **14** as shown in FIG. **6**, the trigger valve **141** returns to the original open state so that the first air chamber **10** re-collects high-pressure air. Thus, the dish-shaped piston **4** moves downward to return to the original state, and closes the air communication from the second air chamber **20** to the cylinder **2**. Before the hitting piston **3** moves upward to its upper dead center, the high-pressure air in the third air chamber **30** and in the cylinder above the hitting piston **3** can be exhausted into the atmosphere, and the upper sleeve valve **5** is driven to move upward by the high-pressure air in the fourth air chamber **40**, and the lower sleeve valve **6** is driven to move downward to close the bottom exhausting holes **18** by the high-pressure air in the fourth air chamber **40** or in the ring groove **50**. Thus, the fluid communication between the bottom vent holes **22** and the fourth air chamber **40** is opened, and the high pressure air in the fourth air chamber **40** is guided into the bottom region of the cylinder **2** to stably drive the hitting piston **3** to move upward. At this time, the high pressure air remaining in the upper layer of the hitting piston **3** is discharged through the top exhausting hole **19**.

When the hitting piston **3** is moved to its upper dead center, the top vent holes **21** is closed, the high pressure air in the third air chamber **30** drives the upper sleeve valve **5** to move downward to its original state, and the fluid communication from the fourth air chamber **40** to the lower sleeve valve **6** is closed, and the lower sleeve valve **6** upward moves for depositing. Thus, a single shot cycle is terminated.

Therefore, from above description, it is known that in the above embodiment of the present invention, the pneumatic nail gun utilizes the upper and the lower slidable sleeve valves **5**, **6** to realize the stably upward movement of the

piston **3** through rapidly and continuously guiding the compressed high pressure air into the cylinder **2** in the process of upward deposition of the hitting piston **3**.

According to a pneumatic nail gun of third embodiment, a lower slidable sleeve valves **6** can utilize at least one upper step **62** formed at a top portion thereof and a lower step **63** formed at a lower portion thereof to replace the spring (as shown in FIG. **11**). The upper step **62** has a forcing area **A1** larger than that of a forcing area **A2** of the lower step **63** (as shown in FIG. **12**). The upper step **62** are pushed by the high pressure air from the fourth air chamber **40** or from the ring groove **50** which guides the high pressure air from the fourth air chamber **40**. The lower step **63** are pushed by the high pressure air from a main air passage **60** formed in the gun body **1**, which guides the high pressure air in the fourth air chamber **40**. The lower slidable sleeve valve **6** further provides two air-tight rings **6***a*, **6***b* between its outer peripheral surface and the inner surface of the gun body **1**. The lower step **63** and an entrance of the main air passage **60** are disposed between the two air-tight rings **6***a*, **6***b*. Thus, when the upper slidable sleeve valve **5** moves downward for deposition (as shown in FIG. **13**), the upper step **62** doesn't receive any one pressure thrust of the high-pressure air, and the lower step **63** is pushed by the high-pressure air from the main air passage **60**, which assures the lower slidable sleeve valve **6** moves upwardly. When the upper slidable sleeve valve **5** moves upward (as shown in FIG. **14**), the upper step **62** is pushed by the high-pressure air from the fourth air chamber **40** (or the ring groove **50**). Because the forcing area **A1** of the upper step **62** is larger than that of the lower step **63**, the pressure thrust loaded at the upper step **62** is larger than that at the lower step **63**, which assures the lower slidable sleeve valve **6** moves downwardly. Thus, the bottom spring **61** (as shown in FIG. **3**) can be omitted and the cost can be lowered.

The above description is given by way of example, and not limitation. Given the above disclosure, one skilled in the art could devise variations that are within the scope and spirit of the invention disclosed herein, including configurations ways of the recessed portions and materials and/or designs of the attaching structures. Further, the various features of the embodiments disclosed herein can be used alone, or in varying combinations with each other and are not intended to be limited to the specific combination described herein. Thus, the scope of the claims is not to be limited by the illustrated embodiments.

What is claimed is:

1. A pneumatic nail gun comprising:

a gun body, which has a main air housing collecting a compressed high pressure air with a constant pressure, and a trigger at one end of the main air housing driving the high pressure air to shoot a nail;

a cylinder fixed in the main air housing;

a hitting piston slidably movable in the cylinder;

a dish-shaped piston disposed at a top end portion of the cylinder, which is driven to move upward and guide the high pressure air into the cylinder for driving the hitting piston to rapidly move downward when the trigger is pressed, and is driven to move downward by the high pressure air in the main air house for closing the fluid communication into the cylinder when the trigger is released;

an upper slidable sleeve valve disposed at a top portion of an outer peripheral surface of the cylinder, which is driven to move upward by the high pressure air in the main air housing when the trigger is released;

a lower slidable sleeve valve disposed at a lower portion of an outer peripheral surface of the cylinder, which is driven to move downward for guiding the high pressure air into the cylinder for upward deposition of the hitting piston when the upper slidable sleeve valve moves upward, and is driven upward when the hitting piston moves to its upper dead center, the upper slidable sleeve valve being driven to downward reposite and closing the fluid communication to the lower slidable sleeve valve.

2. The pneumatic nail gun as claimed in claim **1**, further comprising:

a first air chamber formed between a top end of the dish-shaped piston and an inner peripheral surface of the gun body; which receives the high pressure air from the main air housing when the trigger is released, and exhausts the high pressure air when the trigger is pressed;

a second air chamber formed between the dish-shaped piston and a top portion of an outer peripheral surface of the cylinder, which receives the high pressure air from the main air housing and drives the dish-shaped piston to move upward when the high-pressure air in the first air chamber is discharged.

3. The pneumatic nail gun as claimed in claim **2**, wherein a top spring is disposed in the first air chamber, a sum of an elastic deformation force of the top spring and a pressure thrust of the high-pressure air in the first air chamber being larger than a pressure thrust of the high-pressure air in the second air chamber, and an elastic deformation force of the top spring being smaller than the pressure thrust of the high-pressure air in the second air chamber.

4. The pneumatic nail gun as claimed in claim **1**, further comprising:

a third air chamber formed among the cylinder, the upper slidable sleeve valve and the inner peripheral surface of the gun body, which fluidly communicates with the main air housing through a first through hole at the gun body, the high-pressure air therein driving the upper slidable sleeve valve to move downward when the dish-shaped piston moves downward and the hitting piston moves upward;

a plurality of top vent holes formed at a top portion of the cylinder, which communicates the third air chamber and the cylinder, and guides the high pressure air to discharge into the cylinder when the upper sleeve valve and the dish-shaped piston move downward, and closes the fluid communication from the third air chamber to the cylinder when the upper slidable sleeve valve moves downward and the hitting piston moves upward;

a fourth air chamber formed between an inner peripheral surface of the gun body and an outer peripheral surface of the upper slideable sleeve valve, which guides compressed high-pressure air in the main air housing to the fourth air chamber through at least one second through hole formed in the gun body, and drives the upper slidable sleeve valve to move upward when the high-pressure air in the third air chamber is discharged; and

a plurality of bottom vent holes positioned at a bottom end portion of the cylinder, which guides the high-pressure air in the fourth air chamber into the cylinder to drive the hitting piston to upwardly move, when the lower sleeve valve moves downward.

5. The pneumatic nail gun as claimed in claim **4**, wherein an intermediate spring is provided in the third air chamber, a sum of an elastic deformation force of the intermediate

spring and a pressure thrust of the high-pressure air in the third air chamber being larger than a pressure thrust of the high-pressure air in the fourth air chamber, and the elastic deformation force of the intermediate spring being smaller than a pressure thrust of the high-pressure air in the fourth air chamber.

6. The pneumatic nail gun as claimed in claim **4**, further comprising a step at a peripheral surface of an upper slidable sleeve valve, two air-tight rings assembled in an outer peripheral surface of the upper slidable sleeve valve, respectively, and an exhausting hole at the gun body between the two air-tight rings for decreasing a force acting area and a pressure thrust of a high-pressure air in the fourth air chamber.

7. The pneumatic nail gun as claimed in claim **4**, further comprising a ring groove defined by the outer peripheral surface of the cylinder, the upper slidable sleeve valve, the lower slidable sleeve valve, and the gun body, which drives the lower slidable sleeve valve to move downward when the high pressure air in the fourth air chamber is guided therein.

8. The pneumatic nail gun as claimed in claim **4**, further comprising a bottom spring used to push the lower slidable sleeve valve, which has an elastic deformation force less than a pressure thrust of the high-pressure air in the fourth air chamber guided from the fourth air chamber.

9. The pneumatic nail gun as claimed in claim **4**, wherein the lower slidable sleeve valves has at least one upper step formed at a top portion thereof and a lower step formed at a lower portion thereof, the upper step having a force acting area larger than that of a force acting area of the lower step, the upper step being pushed by the high pressure air from the fourth air chamber, the lower step being pushed by the high pressure air from a main air passage formed in the gun body, which guides the high pressure air in the fourth air chamber.

10. The pneumatic nail gun as claimed in claim **9**, wherein the lower slidable sleeve valve further provides two air-tight rings between its outer peripheral surface and the inner surface of the gun body, the lower step and an entrance of the main air passage being disposed between the two air-tight rings.

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